Exercise 13.1

Question 1:

A plastic box 1.5 m long, 1.25 m wide and 65 cm deep is to be made. It is to be open at the top. Ignoring the thickness of the plastic sheet, determine:

(i) The area of the sheet required for making the box.

(ii) The cost of sheet for it, if a sheet measuring 1m^2 costs ₹ 20.

Answer 1:

(i) Length of plastic box l = 1.5 m, breadth b = 1.25 m and height h = 65 cm = 0.65 m

Area of sheet required for making a plastic box = Total surface area of box – Area of top of box

$= 2(lb + bh + hl) - lb = 2(1.5 \times 1.25 + 1.25 \times 0.65 + 0.65 \times 1.5) - 1.5 \times 1.25\ \text{m}^2$

$= 2(1.875 + 0.8125 + 0.975) - 1.875\ \text{m}^2$

$= 2(3.6625) - 1.875\ \text{m}^2$

$= 7.325 - 1.875 = 5.45\ \text{m}^2$

Hence, the area of the sheet required for making the box is $5.45\ \text{m}^2$.

(ii) Total cost of sheet = ₹ 20× 5.45 = ₹ 109

Question 2:

The length, breadth and height of a room are 5 m, 4 m and 3 m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of ₹ 7.50 per m^2.

Answer 2:

Length of room l = 5 m, breadth b = 4 m and height h = 3 m

Area of four walls and ceiling = Total surface area of room – area of floor = $2(lb + bh + hl) - lb$

$= 2(5 \times 4 + 4 \times 3 + 3 \times 5) - 5 \times 4\ \text{m}^2$

$= 2(20 + 12 + 15) - 20\ \text{m}^2$

$= 2(47) - 20\ \text{m}^2$

$= 94 - 20 = 74\ \text{m}^2$

Therefore, the area of four walls and ceiling = $74\ \text{m}^2$

Hence, the cost of white washing the walls of the room and the ceiling = ₹ 7.50× 74 = ₹ 555.00

Question 3:

The floor of a rectangular hall has a perimeter 250 m. If the cost of painting the four walls at the rate of ₹10 per m^2 is ₹15000, find the height of the hall. [**Hint:** Area of the four walls = Lateral surface area.]

Answer 3:

Let, the length of hall = l m, breadth = b m and height = h m

Perimeter of floor = $2(l + b)$

According to question, $2(l + b) = 250$ m ... (1)

Area of four walls of hall = $2(l + b)h$

So, the cost of painting the four walls at the rate of ₹10 per m^2 = $2(l + b)h \times$ ₹10

$= 250h \times$ ₹10 [∵ From equation (1)]

= ₹ $2500h$

According to question, ₹ $2500h$ = ₹15000

$$\Rightarrow h = \frac{15000}{2500} = 6\ \text{m}$$

Hence, the height of the hall is 6 m.

Question 4:

The paint in a certain container is sufficient to paint an area equal to 9.375 m^2. How many bricks of dimensions 22.5 cm × 10 cm × 7.5 cm can be painted out of this container?

Answer 4:

Length of one brick l = 22.5 cm, breadth b = 10 cm and height h = 7.5 cm

Total surface area of brick = $2(lb + bh + hl)$ = $2(22.5 \times 10 + 10 \times 7.5 + 7.5 \times 22.5)$ cm^2

= $2(225 + 75 + 168.75)$ cm^2 = 937.5 cm^2 = 0.09375 m^2

Number of bricks to be painted = $\frac{\text{Total paint available}}{\text{Paint for one brick}} = \frac{9.375\ m^2}{0.09375\ m^2} = 100$

Hence, the paint of this container can paint 100 bricks.

Question 5:

A cubical box has each edge 10 cm and another cuboidal box is 12.5 cm long, 10 cm wide and 8 cm high.

(i) Which box has the greater lateral surface area and by how much?

(ii) Which box has the smaller total surface area and by how much?

Answer 5:

(i) Side of cubical box l =10 cm

Curved surface area of cubical box = $4l^2$ = $4(10)^2$ cm^2 = $4(100)$ cm^2 = 400 cm^2

Length of cuboidal box l = 12.5 cm, breadth b = 10 cm and height h = 8 cm

Curved surface area of cuboidal box = $2(l + b)h$ = $2(12.5 + 10) \times 8$ cm^2 = $2(22.5) \times 8$ cm^2 = 360 cm^2

Difference between surface areas of two boxes =400 cm^2 − 360 cm^2 = 40 cm^2

Hence, the curved surface area of cubical box is more than cuboidal box by 40 cm^2.

(ii) Side of cubical box l =10 cm

Total surface area of cubical box = $6l^2$ = $6(10)^2$ cm^2 = $6(100)$ cm^2 = 600 cm^2

Length of cuboidal box l = 12.5 cm, breadth b = 10 cm and height h = 8 cm

Total surface area of cuboidal box = $2(lb + bh + hl)$

= $2(12.5 \times 10 + 10 \times 8 + 8 \times 12.5)$ cm^2 = $2(125 + 80 + 100)$ cm^2

= $2(305)$ cm^2

= 610 cm^2

Difference between total surface areas of two boxes =610 cm^2 − 600 cm^2 = 10 cm^2

Hence, the total surface area of cubical box is more than cuboidal box by 10 cm^2.

Question 6:

A small indoor greenhouse (herbarium) is made entirely of glass panes (including base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high.

(i) What is the area of the glass?

(ii) How much of tape is needed for all the 12 edges?

Answer 6:

(i) Length of greenhouse l = 30 cm, breadth b = 25 cm and height h = 25 cm

Total surface area of greenhouse = $2(lb + bh + hl)$

= $2(30 \times 25 + 25 \times 25 + 25 \times 30)$ cm^2 = $2(750 + 625 + 750)$ cm^2

= $2(2125)$ cm^2

= 4250 cm^2

Hence, the area of glass for greenhouse is 4250 cm^2.

(ii) Length of greenhouse l = 30 cm, breadth b = 25 cm and height h = 25 cm
Length of tape for all 12 edges (4 Length, 4 Breadth and 4 Height) = $4(l + b + h)$
= $4(30 + 25 + 25)$ cm = $4(80)$ cm
= 320 cm
Hence, for all 12 edges, 320 cm tape is required.

Question 7:

Shanti Sweets Stall was placing an order for making cardboard boxes for packing their sweets. Two sizes of boxes were required. The bigger of dimensions 25 cm × 20 cm × 5 cm and the smaller of dimensions 15 cm × 12 cm × 5 cm. For all the overlaps, 5% of the total surface area is required extra. If the cost of the cardboard is ₹4 for 1000 cm^2, find the cost of cardboard required for supplying 250 boxes of each kind.

Answer 7:

For bigger boxes:
Length of box l = 25 cm, breadth b = 20 cm and height h = 5 cm
Total surface area of 1 bigger box = $2(lb + bh + hl)$
= $2(25 \times 20 + 20 \times 5 + 5 \times 25)$ cm^2 = $2(500 + 100 + 125)$ cm^2 = $2(725)$ cm^2 = 1450 cm^2
Area of cardboard for overlap = 5% of 1450 cm^2 $= 1450 \times \frac{5}{100} = 72.5$ cm^2
Total area of cardboard for1 bigger box =$1450 + 72.5 = 1522.5$ cm^2
Therefore, the area of cardboard for 250 bigger boxes =250×1522.5 cm^2 $= 380625$ cm^2

For smaller boxes:
Length of box l = 15 cm, breadth b = 12 cm and height h = 5 cm
Total surface area of 1 smaller box = $2(lb + bh + hl)$
= $2(15 \times 12 + 12 \times 5 + 5 \times 15)$ cm^2 = $2(180 + 60 + 75)$ cm^2
= $2(315)$ cm^2
= 630 cm^2
Area of cardboard for overlap = 5% of 630 cm^2 $= 630 \times \frac{5}{100} = 31.5$ cm^2
Total area of cardboard for1 smaller box =$630 + 31.5 = 661.5$ cm^2
Therefore, the area of cardboard for 250 smaller boxes =250×661.5 cm^2 $= 165375$ cm^2
So, the area of cardboard for 500 boxes =$380625 + 165375 = 546000$ cm^2
Total cost of cardboard at the rate of ₹ 4 per 1000 cm^2 = ₹ $546000 \times \frac{4}{1000} =$ ₹ 2184
Hence, the total cost of cardboard for 500 boxes is ₹ 2184.

Question 8:

Parveen wanted to make a temporary shelter for her car, by making a box-like structure with tarpaulin that covers all the four sides and the top of the car (with the front face as a flap which can be rolled up). Assuming that the stitching margins are very small, and therefore negligible, how much tarpaulin would be required to make the shelter of height 2.5 m, with base dimensions 4 m × 3 m?

Answer 8:

Length of shelter l = 4 m, breadth b = 3 m and height h = 2.5 m
Area of four walls and top of shelter = total area of shelter – area of floor = $2(lb + bh + hl) - lb$
= $2(4 \times 3 + 3 \times 2.5 + 2.5 \times 4) - 4 \times 3$ m^2
= $2(12 + 7.5 + 10) - 12$ m^2
= $2(29.5) - 12$ m^2
= $59 - 12 = 47$ m^2
Hence, 47 m^2 tarpaulin is required to make this shelter.